Today's Lecture
1/14/09

- Stylistic variants
- Counterexamples : categorical statements
- Strength and Cogency

Stylistic variants: If-then

Consider this statement:

(*) If the sky is blue, then the sky has a color.

All of the following are equivalent ways of expressing (*):

- *Given that* the sky is blue, the sky has a color.
- *Assuming that* the sky is blue, the sky has a color.
- The sky has a color if the sky is blue.
- The sky has a color *given that* the sky is blue.
- The sky has a color *assuming* the sky is blue.
- The sky is blue *only if* the sky has a color.

Stylistic variants: Not

Consider this statement:

(*) It is false that the sun orbits the earth.

All of the following are equivalent ways of expressing (*):

- It is false that the sun orbits the earth.
- It is not the case that the sun orbits the earth.
- The sun does not orbit the earth.
- The earth is not orbited by the sun.

Is our method flawed?

Consider this argument:

1. All Dogs are Animals.
2. All Animals are composed of Matter.
3. Thus, all Dogs are composed of Matter.

It is obviously and intuitively *valid.*

let's make sure

Use our statement counterexample method.

1. All Dogs are Animals.
2. All Animals are composed of Matter.
3. Thus, all Dogs are composed of Matter.

form:

1. P.
2. Q.
3. Therefore R.

But that form is invalid!

what gives?

If we just focus on statements, then we blur over some important logical structure inside the statements.

1. **All** Dogs are Animals.
2. **All** Animals are composed of Matter.
3. Thus, all Dogs are composed of Matter.

In extracting the form, we missed out on the 'All' relation between Dogs, Animals, and Matter.

Categorical Statements:

- A categorical statement is a statement that relates two classes or categories, where a class is a set or collection of things.

Terms

- A term is a word or phrase that stands for a class of things.

Examples Forms

1. All stars are hydrogen-fusing things.
2. All humans are mortal.
3. Some moral acts are difficult acts.
4. Some bikes are breakless.
5. No trees are computers.
6. Not all coffins are inhabited.

1. All S are H.
2. All H are M.
3. Some M are D.
4. Some B are R.
5. No T are C.
6. Not all C are I.

counterexamples : categorical statements

Step One: Identify the form of the argument, using capital letters to stand in for terms.

Step Two: Find terms to substitute for the letters so that you get true premises and a false conclusion.

(As before, make sure that the premises are well-known truths and the conclusion is a well-known falsehood.)

Example 1

1. All vegetarians who refuse to eat animal products are vegans.
2. No vegetarians who refuse to eat animal products are cattle ranchers.
3. Hence, no vegans are cattle ranchers.

Step One: Extract Form

Let V: vegetarians who refuse to eat animal products.

Let E: vegans

Let C: cattle ranchers

1. All V are E.
2. No V are C.
3. Hence, no E are C.

Step Two: Find New Terms

1. All V are E.
2. No V are C.
3. Hence, no E are C.

Counterexample 1

Let V: Vixen
Let E: Animals
Let C: Caterpillars

1. All Vixen are Animals.
2. No Vixen are Caterpillars.
3. Hence, no Animals are Caterpillars.

Counterexample 2

Let V: Humans
Let E: Carbon-based things
Let C: Bananas

1. All Humans are Carbon-based things.
2. No Humans are Bananas.
3. Hence, no Carbon-based things are Bananas.

Example 2

1. All destructive acts are evil.
2. Some wars are evil.
3. So, some wars are destructive acts.

Step One: Extract Form

Let D: Destructive act

Let W: War

Let E: Evil

1. All D are E.
2. Some W are E.

Step Two: Find New Terms

1. All D are E.
2. Some W are E.
3. So, some W are D.

<u>Counterexample 1</u>

Let D: plants

Let W: humans

Let E: living

1. All plants are living.
2. Some humans are living.
3. So, some humans are plants.

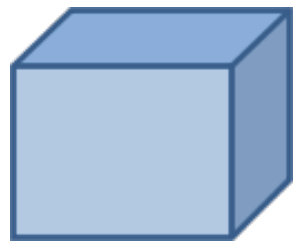
<u>Counterexample 2</u>

Let D: Squares

Let W: Triangles

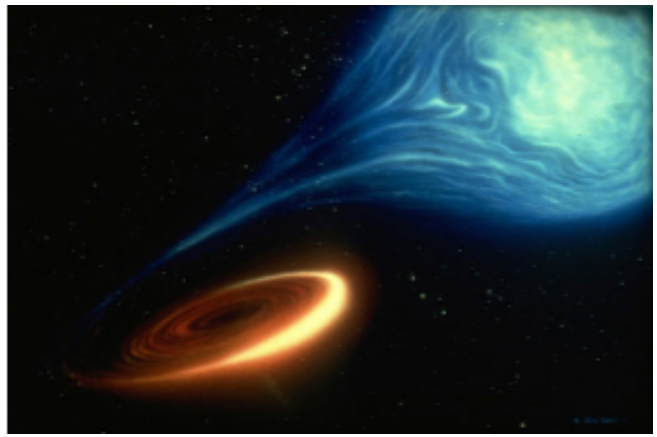
Let E: Shapes

1. All Squares are Shapes.
2. Some Triangles are Shapes.
3. So, some Triangles are Squares.



now you

1. All black holes are stars that have collapsed in on themselves.
2. All black holes are entities that produce a lot of gravity.
3. So, every entity that produces a lot of gravity is a star that has collapsed in on itself.



<u>The form</u>

1. All B are S.
2. All B are G.
3. So, all G are S.

Inductive Arguments: Concepts

Strength and Cogency

Definition of strength

An argument is **strong** $=_{df}$ it's *probable* (but not necessary) that its conclusion is true, if its premises are true.

In other words,

An argument is **strong** $=_{df}$ it's *unlikely* (but not impossible) that it's conclusion is false, given that its premises are true.

Thus,

An argument is **weak** $=_{df}$ it's *not probable* that its conclusion is true, if its premises are true.

Further clarifications

- Strength is defined so as to exclude validity. If an argument is valid it is not strong. If an argument is strong it is not valid.

- Like ‘validity’, ‘strength’ is a technical term applying only to arguments. It doesn’t make sense to say that a statement is strong (or weak).

examples

Statistical syllogism

[strong]

1. A high percentage of people in this class are from a city in California.
2. The person I am pointing to is in this class.
3. Therefore, the person I am pointing to is from a city in California.

[weak]

1. A few people in this class are from a city in Colorado.
2. The person I am pointing to is in this class.
3. Therefore, the person I am pointing to is from a city in Colorado.

examples

Arguments by authority

[strong]

1. Stephen Hawking is one of the world's leading astrophysicists.
2. Hawking says that black holes exist.
3. Therefore, black holes exist.

[weak]

1. Grog hails from a town with no books and no schools.
2. Grog says there is something dangerous in our water supply.
3. Therefore, there is something dangerous in our water supply.

examples

Arguments from analogy

[strong]

1. Heather gets really nervous when she rides in a jumbo jet.
2. A twin-prop airplane is similar to a jumbo jet.
3. Therefore, Heather will get really nervous when she rides in a twin-prop airplane.

[weak]

1. Lance can easily reach 35 mph on flat roads on his bike.
2. Like Lance, Billy wears a US Postal jersey.
3. So, Billy can easily reach 35 mph on flat roads on his bike.

cogency

An argument is **cogent** $=_{df}$

(i) it is *strong* , and

(ii) all of its premises are true.

So an **uncogent** argument is either (i) *weak* or (ii) strong but with at least one false premise.